

AC:

:S



AC RESISTIVE CIRCUITS

Unclassified

2 Hour Conference, W/ 2Hr PE1

**Safety & Environmental Impact is
"LOW"**



AC:

AC Resistive Circuits



Terminal Learning Objective

ACTION:

Identify characteristics of resistor operation
in AC circuits w/voltages of EFF/RMS, Peak, &
Peak/Peak)

CONDITIONS:

With Official OMEMS Training Aids as
reference.

STANDARD:

A minimum accuracy of 70% or 7 of 10
questions correctly answered.





Introduction

In previous lessons we dealt with resistors, resistor color code, determining total resistance, and how resistors functioned in DC circuits. Resistors operate the same in AC Circuits as they did in DC circuits. The type of AC voltage used, (Eff/RMS, Peak, & Peak/Peak) will change the numeric value of the operating parameters in the Ckt.



AC:

AC Resistive Circuits

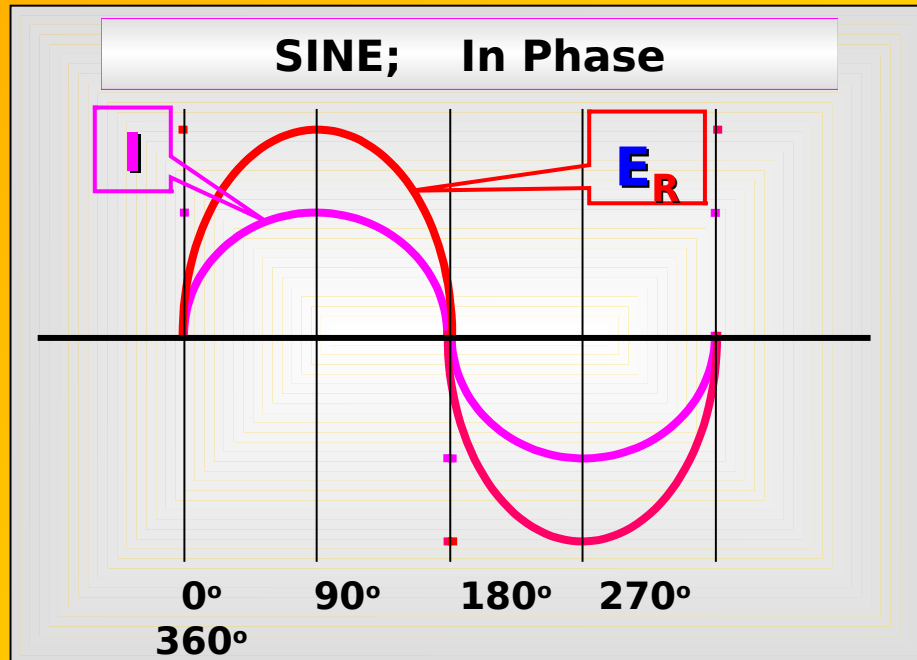


PHASE RELATIONSHIP; The Sine & Vector illustrate the same Concept.

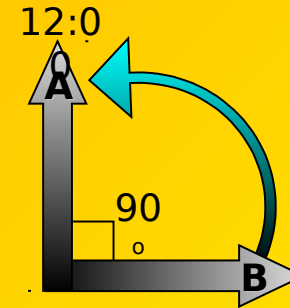
Sine; O-scope Display,
“Voltage and Current are in phase.”

Vector; Mathematical expression

Change in frequency does not change resistance or voltage drop the resistor.



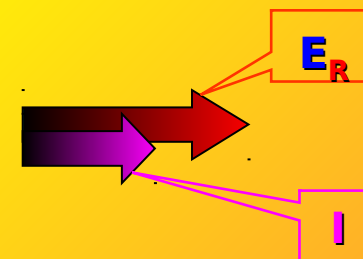
READING THE VECTOR:



Rotating in a counter clockwise direction, entity A is leading B by 90°.

The length of the RAY expresses the Amplitude of the entity.

VECTOR, In Phase



AC Rides DC

AC:

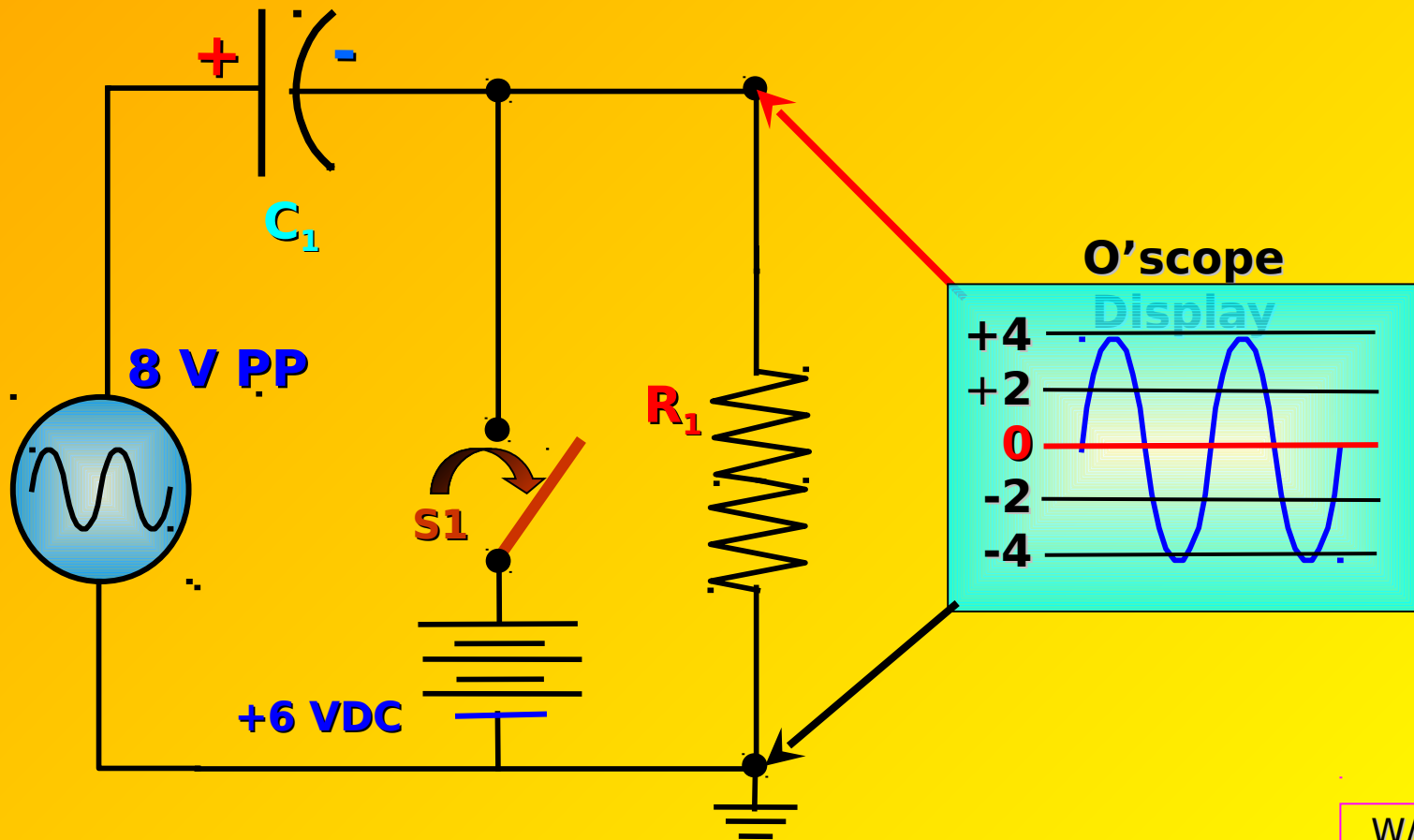
AC Resistive Circuits



AC Rides DC;

Both AC and DC can operate in the same Ckt.

W/S1 OPEN the AC rides on the 0 Volts reference line.



W/S1
Closed
CF351 C03 - 5

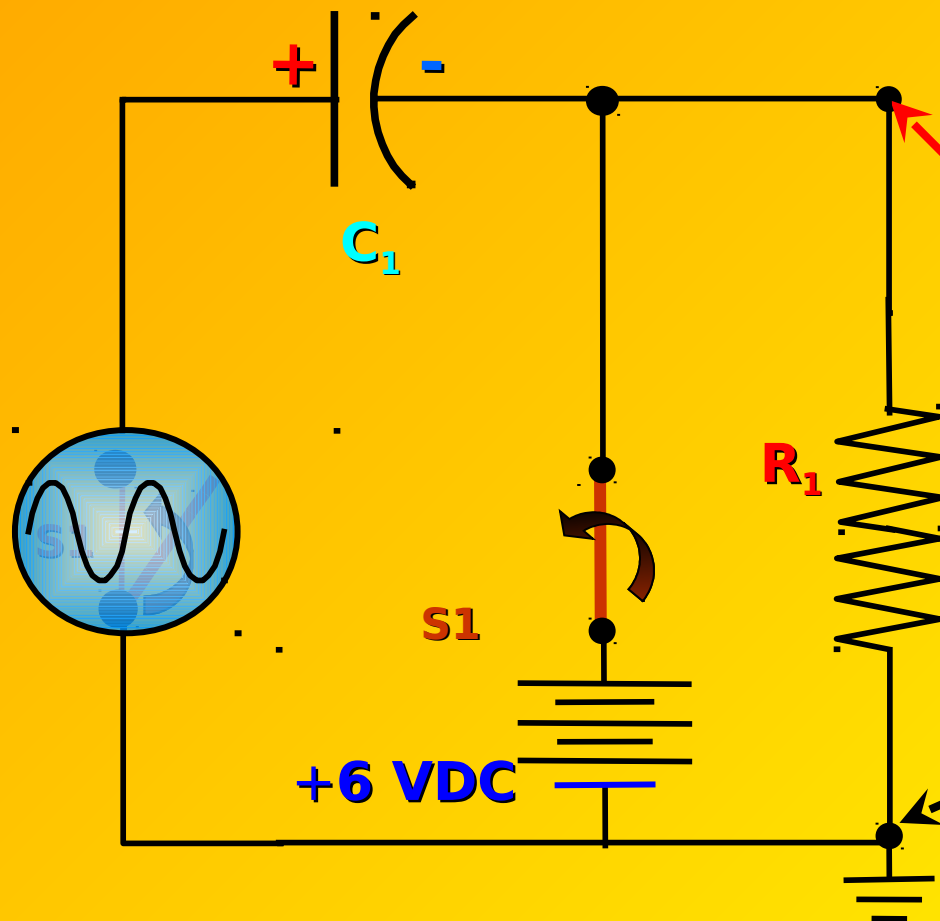
AC:

AC Resistive Circuits



AC Rides DC;

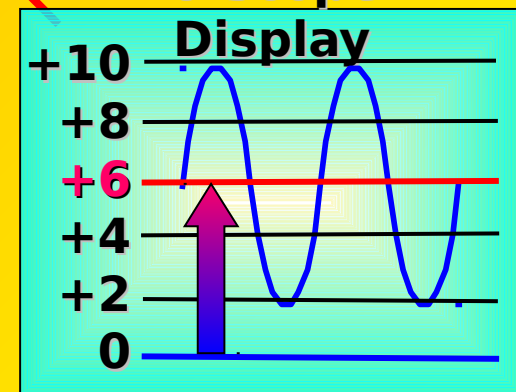
With **S1** Closed the AC will have a new reference.
The Reference has moved from, 0 Volts to **6 Volts**
DC. Both AC and DC can operate in the same Ckt.



**What is the Value of the
AC Displayed on the
O'Scope?**

$$10 - 2 = __\text{VPP} ?$$

O'scope



Voltage
Divider

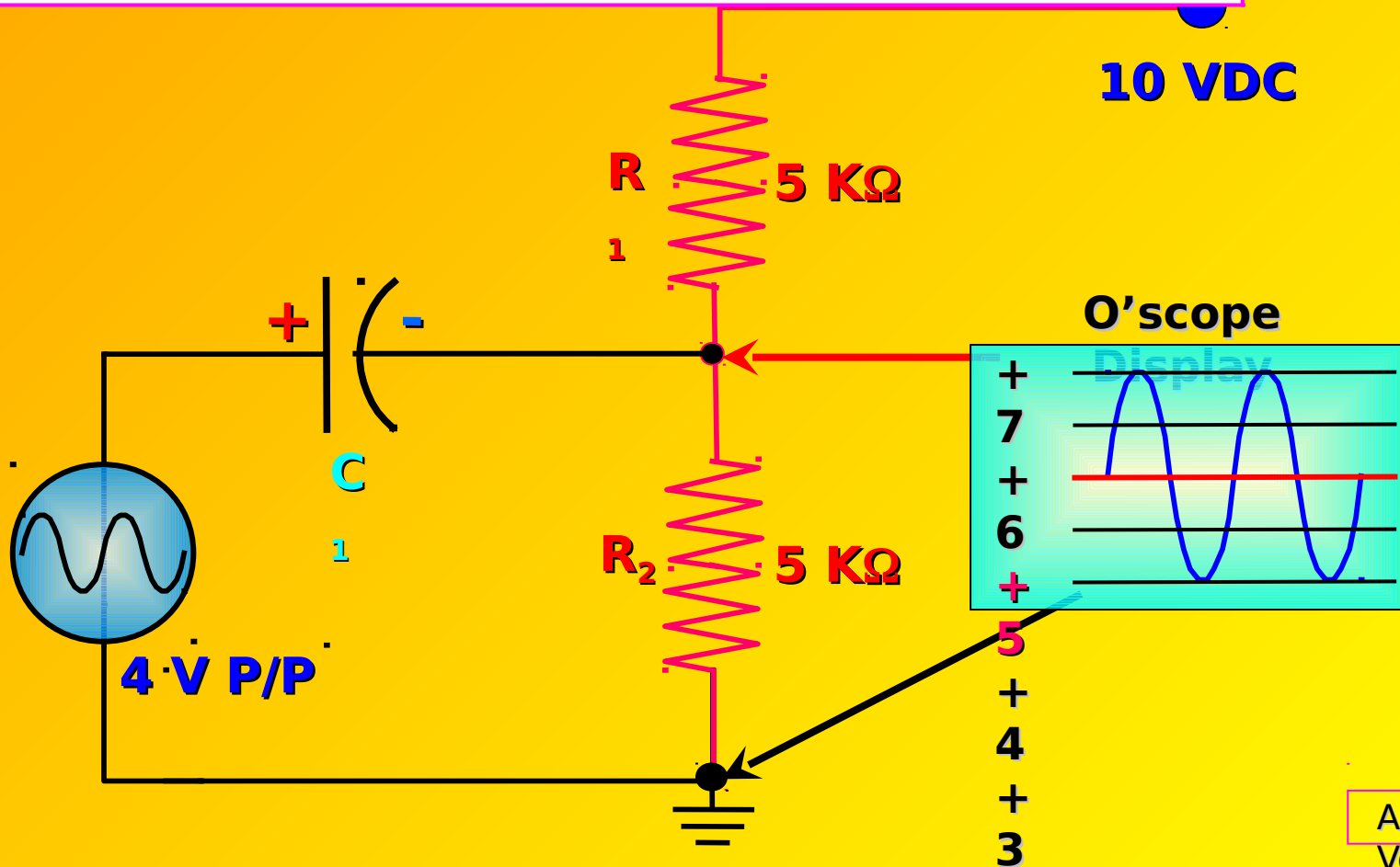
AC:

AC Resistive Circuits



AC Rides DC;

R1 & 2 is a DC Voltage Divider. The O' Scope is displaying the Voltage Drop of R2, [E_{R2}] The **AC Signal is riding the **DC**.**

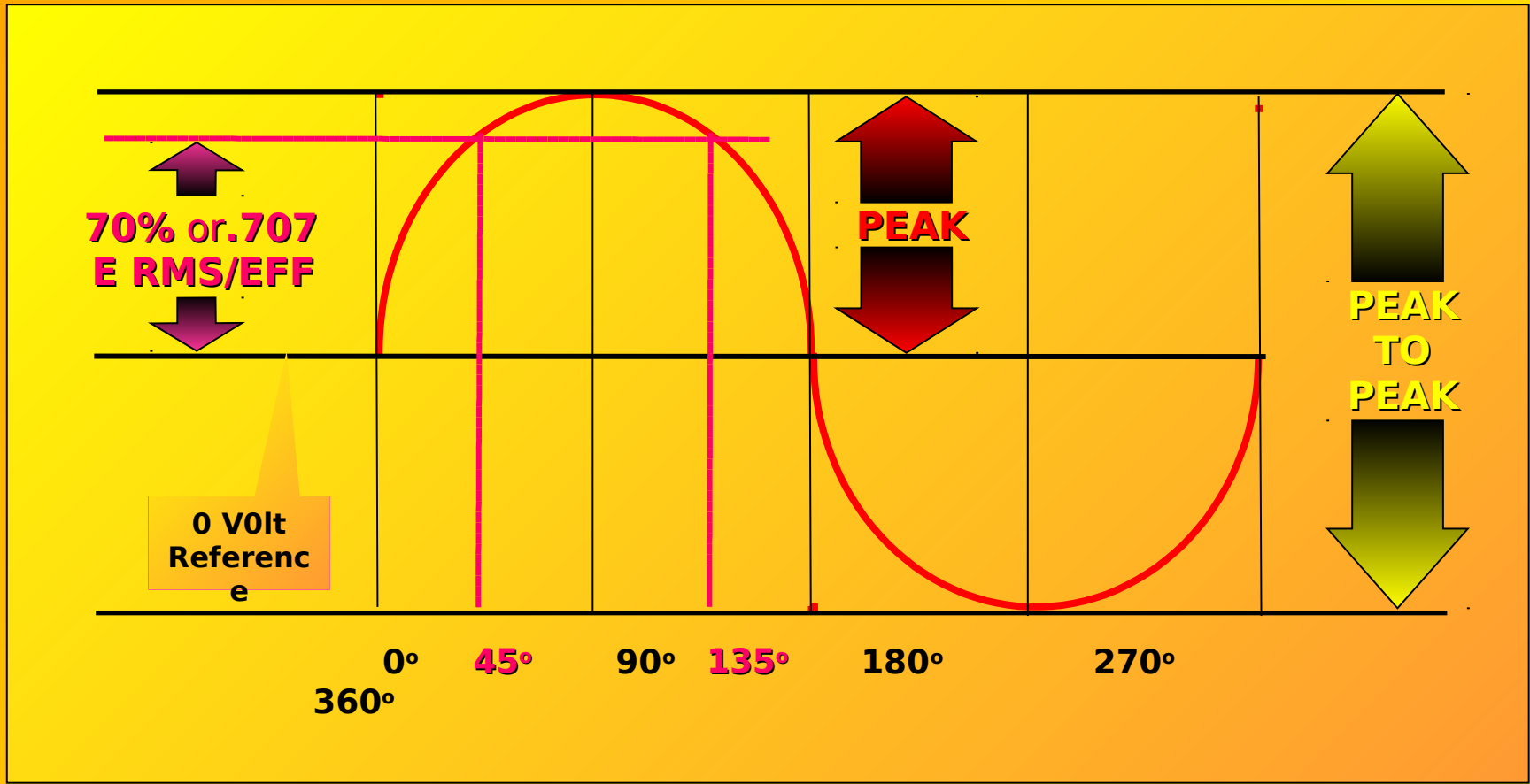


AC:

AC Resistive Circuits



AC Voltages;



Series
Ckt

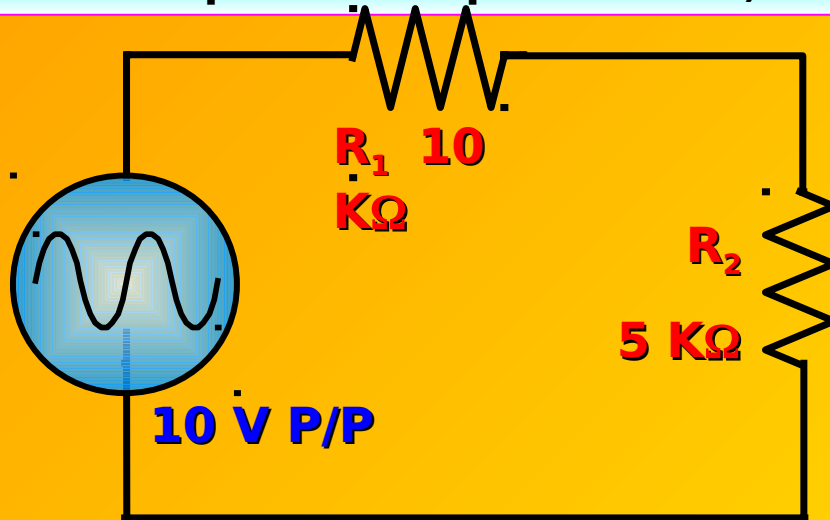
CF351 C03 - 8

AC:

AC Resistive Circuits



Calculate operational parameters;



Kirchhoff's Law

Expressed Mathematically as:

$$E_A = E_{R1} + E_{R2}$$

and Ohm's Laws still apply in AC resistive circuits

$$E_A \text{ — } E_{R1} + E_{R2}$$

$$R_T \text{ — } R_1 + R_2$$

$$I_T \text{ — } E_A \div R_T$$

$$E_{R1} \text{ — } I_T \times R_1$$

$$E_{R2} \text{ — } I_T \times R_2$$

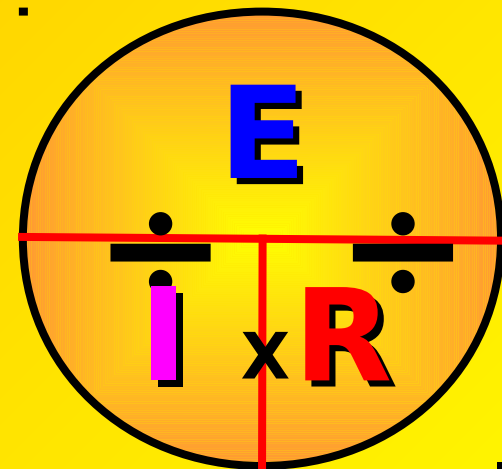
$$E_A \text{ — RMS}$$

$$R_T \text{ — }$$

$$I_T \text{ — }$$

$$E_{R1} \text{ — }$$

$$E_{R2} \text{ — }$$



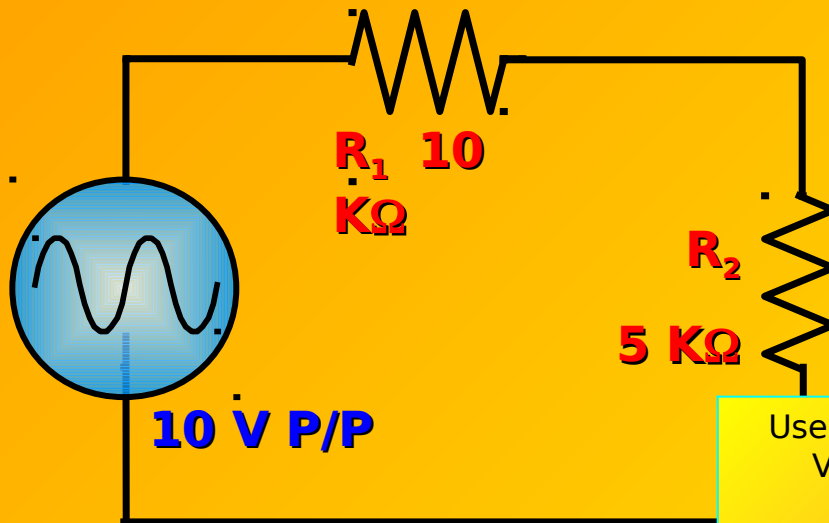
Answer

AC:

AC Resistive Circuits



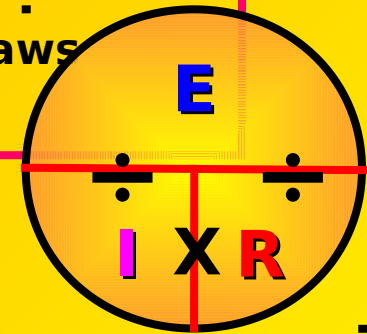
Calculated operational parameters;



Kirchhoff's Law

$$E_A = E_{R1} + E_{R2}$$

Ohm's Laws



Use Ohm's Law or the AC
Voltage Conversion
Constant

$$E_{R1} + E_{R2}$$

$$R_1 + R_2$$

KΩ

$$E_A \div R_T$$

666 mA

$$I_T \times R_1$$

VPP

$$E_A$$

10 VPP

$$R_T$$

15 KΩ

$$I_T$$

$$E_{R1}$$

6.66

$$\div 2.828$$

$$=$$

$$= 2.828$$

$$=$$

$$\div 2.828$$

$$=$$

$$E_A$$

3.5 AC

$$R_T$$

15 KΩ

$$I_T$$

.235 mA

$$E_{R1}$$

2.35 VAC

$$E_{R2}$$

1.17 VAC

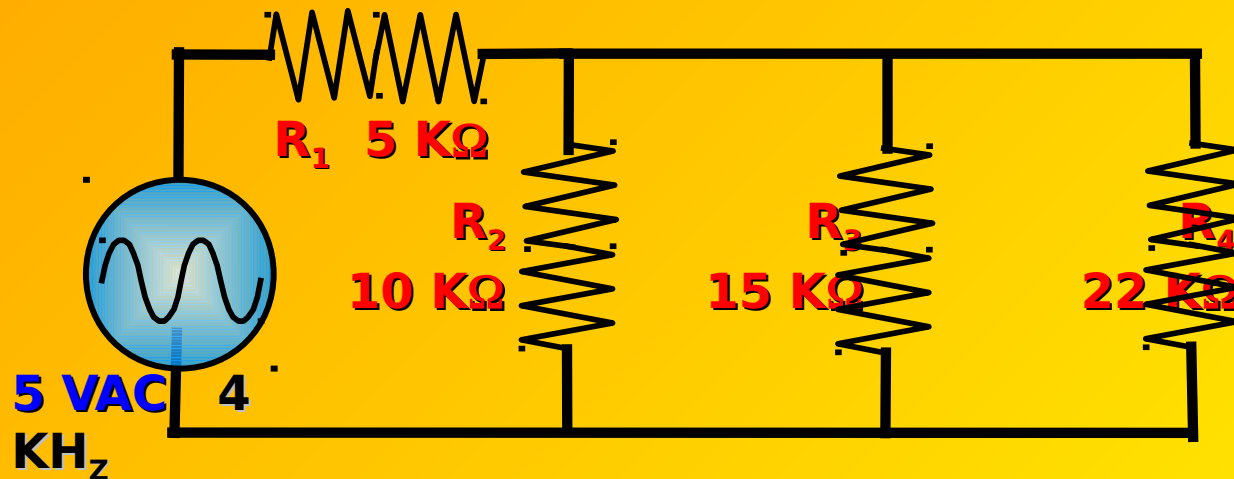
S & P Ckt

AC:

AC Resistive Circuits



Calculate; Operating parameters in VAC P/P & VAC P.



$$E_A = 5 \text{ VAC}$$

$$R_{EQ} = 4.71 \text{ K}\Omega$$

$$R_T = 9.71 \text{ K}\Omega$$

$$I_T = .515 \text{ mA}$$

$$E_{R1} = 2.575 \text{ VAC}$$

$$E_{REQ} = 2.426 \text{ VAC}$$

$$E_A = __ \text{ P/P}$$

$$R_{EQ} =$$

$$R_T =$$

$$I_T =$$

$$E_{R1} =$$

$$E_A = __ \text{ PK}$$

$$R_{EQ} =$$

$$R_T =$$

$$I_T =$$

$$E_{R1} =$$

Answer

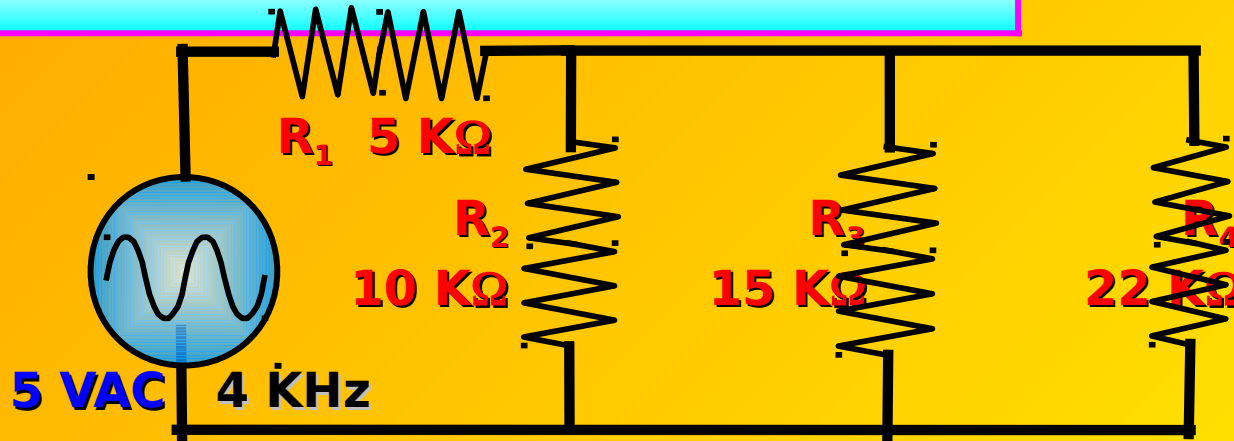
S

AC:

AC Resistive Circuits



Calculated; Operating parameters in VAC P/P & VAC P.



$$E_A = 5 \text{ VAC}$$

$$\times 2.828$$

$$E_A =$$

$$14.14 \text{ VP/P}$$

$$\div 2 =$$

$$E_A = 7.07$$

$$\text{VPK}$$

$$R_{EQ} = 4.71 \text{ K}\Omega$$

$$R_{EQ} = 4.71 \text{ K}\Omega$$

$$R_{EQ} = 4.71 \text{ K}\Omega$$

$$R_T = 9.71 \text{ K}\Omega$$

$$R_T = 9.71 \text{ K}\Omega$$

$$R_T = 9.71$$

$$I_T = .515 \text{ mA}$$

$$I_T = 1.45 \text{ mA}$$

$$\text{K}\Omega$$

$$E_{R1} = 2.575 \text{ VAC}$$

$$E_{R1} = 7.28$$

$$I_T = .72 \text{ mA}$$

$$E_{REQ} = 2.426 \text{ VAC}$$

$$\text{VP/P}$$

$$E_{R1} = 3.64$$

$$\text{VPK}$$

$$E = 6.86$$

AC:

AC Resistive Circuits



Concepts;

AC Resistive Circuits is a review of Series, Parallel, and Series/Parallel Circuits.

Ohm's and Kirchhoff's Laws are still valid in the calculations for AC Resistive Circuits.

Voltage and Current are in phase in AC Resistive Circuits.

Changes in frequency DOES NOT affect resistance values and there associated voltage drops [ER].

Close

AC:

AC Resistive Circuits



LESSON TEST;

Time; 20 Minutes.

**References; Official OMEMS
Training Aids.**

**Standard; 7 of 10 correct answers a
70% minimum.**

